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# Morice Timber Supply Area
# Timber Supply Review

Data Package

March 2001

District Manager
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Director
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# 1. Introduction

This Data Package outlines the basic information and assumptions that are required for the Morice Timber Supply Area (TSA) timber supply analysis.

This data package contains those timber supply model inputs that represent current performance for the timber supply area. For the timber supply review, "current performance" can be defined:

- the current forest management regime - the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management guidelines used in the area
- the standards used to approve or reject forest development plans
- fully implemented land-use plans,
- land-use decisions approved by Cabinet
- other approved BC Forest Service and joint agency forest management practices and policy.

The objective of the timber supply review process is to model "what is" not "what if". Future changes in forest management practices and data will be captured in future timber supply analyses.

Each section of this data package is organized as follows:

1) Short explanation of the data required;
2) Data table; and
3) Source of the data and comments.

This data package, while representing the best available knowledge and information today, is subject to change. As noted in several sections, until the timber harvesting land base is determined, it is not possible to finalize the values entered in some of the tables in this package. For example, preliminary information may be included in the data table or information may not yet be available. In addition, if any major changes to management regimes occur over the next few months, the timber supply analysis will attempt to capture these changes. The final timber supply analysis report will include a technical appendix that describes all the information used in the analysis and highlights any changes made to this package.

# 2. Current Forest Management Consideration and Issues

## 2.1 Base case management assumptions

Base case management assumptions reflect currently available information regarding the status of forest land and its capacity to grow timber, and currently implemented forest management practices. The harvest forecast developed from these assumptions is termed the "base case" harvest forecast and is used in the analysis as a baseline term of reference. Section 7, "Sensitivity Analyses," identifies areas of uncertainty in the data and assumptions used in the base case and outlines sensitivity analyses to be performed.

## 2.2 Statement of major forest management considerations and issues

The major forest management issues and considerations in the Morice TSA are listed in the table below. Where issues are defined within legislation, regulations or standards, their implications will be included in the assessment of timber supply. If significant uncertainties exist in defining current management, sensitivity analysis may assist in providing the decision maker with a measure of potential timber supply implications and assessing the risk to timber supply during the allowable annual cut (AAC) determination.

*Table 1. Major forest management considerations*

| Consideration/Issue | Description |
|---|---|
| Site Productivity (adjustments from paired plot studies of managed pine stands) | In the base case, site index adjustments based on paired plot results will be applied to managed pine leading stands. |
| Landscape level biodiversity | Draft landscape unit (LU) boundaries have been delineated but not legally established for the Morice TSA. In the base case, maintenance of seral stage objectives in each LU will be managed to maintain 45 percent of the area in the lower, 45 percent in the intermediate, and 10 percent in the higher biodiversity emphasis options (BEO's). The impact of applying draft BEOs for each LU will be examined in a sensitivity analysis. |
| Stand level biodiversity | The wildlife tree requirements of the Forest Practices Code (FPC) *Landscape Unit Planning Guide* will be represented as current practice in the analysis. |
| Riparian areas | Requirements from the FPC for riparian reserve (RRZ) and management (RMZ) zones will be included in the analysis as per current practice. |
| Inclusion of district manager's policy on visually sensitive area management | In November 1998, the district manager instituted his policy prescribing measures to be taken in the management of visually sensitive areas. Existing Visual Quality Classes (VQC's) are recommended and at this time, not approved under the FPC. The base case will reflect this policy as current practice. |
| Morice River LRUP Zone A | Areas in Zone A of the Morice River LRUP are subject to management guidelines operationally and will be handled in the analysis through the application of forest cover constraints. |
| Green-up | FPC green-up requirements will be included in the analysis as per current practice (i.e. visually sensitive areas, 5-meter green-up height). |

*continued*

*Table 1. Major forest management considerations (concluded)*

| Consideration/Issue | Description |
|---|---|
| Telkwa caribou herd recovery program | Forest cover requirements will be applied to reflect the Memorandum of Understanding (MOU) between government agencies and licensees' describing appropriate forest management activities that will minimize the impact on the herd. |
| Forest health | The Morice TSA is experiencing epidemic levels of bark beetle infestations. The timber supply implications of different short-term harvest levels (historic and elevated) in stands at risk, will be assessed. |
| Proposed protected areas | Proposed protected areas were approved by cabinet as official study areas and are deferred from harvest except for limited fire and forest health concerns. The implication to timber supply will be assessed in the base case by deferring these areas from harvest for the first decade. In a sensitivity analysis 50% of the timber harvesting land base associated with official study areas will be excluded, as it is likely that about half of the study areas will become officially designated protected areas. |
| Economic-operability | Some areas in the Morice TSA have limited access, low value timber and very high road-building costs. These areas have been excluded from the base case analysis. These areas include the Nanika and Burnie landscape units, and portions of the Morice Lake, Sibola and Troitsa landscape units. A sensitivity analysis will be run to determine the impact of including these areas in the timber harvesting land base. |

# 3. Inventories

## 3.1 Background information

Table 2 lists the inventories that will be used to define the timber harvesting land base, areas where specific forest management activities are currently applied, and areas where specific forest resource objectives must be accounted for.

*Table 2. Inventory information*

| Data | Source | Vintage | Scale |
|---|---|---|---|
| Forest cover (FC1/FIP) | MOF | 1993, 1995, 1998 | 1:20,000 |
| TSA boundaries | MOF (district) | 1999 | 1:50,000 |
| Forest health hazard | MOF (District) | 1998 | 1:50,000 |
| Telkwa caribou herd recovery area | MELP | 1997 | 1:50,000 |
| Landscape unit boundaries | MOF/MELP | 1998 | 1:20,000 |
| Biogeoclimatic ecosystem classification (BEC) | MELP | 1998 | 1:250,000 |
| Natural disturbance types | MOF (District) | 1998 | 1:250,000 |
| Protected area strategy (Phase II) | MELP | 1998 | 1:50,000 |
| Operability | MOF (District) | 1998 | 1:20,000 |
| Local Resource Use Plan (LRUP) boundaries | MOF (District) | 1995 | 1:20,000 |
| Roads | MOF (District) | 1999 | 1:20,000 |
| Road buffers | MOF (District) | 2000 | 1:20,000 |
| Stream and wetland classification | MOF (District) | 1999 | 1:20,000 |
| Stream and wetland riparian buffers | MOF (District) | 2000 | 1:20,000 |
| Visual landscape Inventory | MOF (District) | 1999 | 1:20,000 |
| Recreation features | MOF | 1998 | 1:20,000 |
| Five year Forest Development Plans (details proposed and approved blocks) | District & licensees | 1999 | 1:20,000 |
| District woodlots | MOF (District) | 1998 | 1:20,000 |

Data Source and Comments:

### Forest cover

Disturbance information is updated on the forest cover (FC1/FIP) maps to 1993 (13 maps), 1995 (36 maps) and 1998 (93 maps).

### TSA boundaries

The TSA boundaries are done to Terrain Resource Inventory Mapping (TRIM) heights of land and was created by the district data hub. This data set has been in use by licensees for 2 years and is not the newly created legal atlas version.

### Forest health hazard

This is a resultant information layer that uses forest cover attributes to define the susceptibility of Spruce, Balsam and Lodgepole pine trees to attack by Bark Beetles. This information layer has been used by licensees over the past 2-3 years to help plan strategic and operational activities and is an internal part of the in the Morice District Bark Beetle Strategy.

# 3. Inventories

### Telkwa caribou herd recovery area

The boundaries of the Telkwa caribou herd recovery area (TCRA) were established by MELP in 1997. In April 1999, the interim harvesting guidelines were agreed to between licensees and government agencies. The guidelines cover harvesting and road access within the TCRA.

### Landscape unit boundaries

The licensees, MELP and MOF are using the current boundaries in various strategic and operational plans and reports (i.e. Regional Landscape Unit Strategy report, Forest Development Plan (FDP) reports). Twenty-two draft landscape units have been delineated to TRIM heights of land in the Morice TSA.

### Biogeoclimatic mapping

Biogeoclimatic ecosystem mapping (BEC) mapping has been updated since the 1996 timber supply analysis.

### Natural disturbance types

In 1995, five natural disturbance types (NDT's) were identified throughout the province as uniquely distinct natural disturbance regimes. Each NDT includes a unique grouping of biogeoclimatic zones, subzones and variants and is defined in the *Landscape Unit Planning Guide*. NDT's were assigned to the Morice TSA based on BEC mapping and the guidance provided in the *Landscape Unit Planning Guide*. The licensees, MELP and MOF are currently using the existing BEC and NDT mapping in their FDP maps and reports.

### Protected Area Strategy

There are a number of areas that were proposed for protection in the early 1990's. The boundaries for most of the areas in the Morice TSA have not undergone revisions since 1996 with the exception of Nanika-Kidprice protected area. The resolution of protected areas would likely occur during the Landscape and resource management plan (LRMP) process, which is expected to begin this fall.

### Operability

The operability information was developed locally in the Morice TSA, using the TRIM data. The operability classes were created to generally identify opportunity for different harvest systems. Additionally, an internal MOF review showed almost no harvesting occurring above the 1360m contour line and staff concluded that forested stands above the 1360m contour line were not being harvested and therefore should be removed from the timber harvesting land base. Stands below the 1360 m contour line are included in the timber harvesting land base.

### Local Resource Use Plans – boundaries

There are two Local Resource Use Plans (LRUP's) approved in the Morice TSA (Morice and Nadina). The approval was prior to the FPC becoming established in 1995. Both LRUP's were the result of extensive consultations with local stakeholders to identify stand level management objectives and guidelines. These two LRUP's are not approved under the FPC but are considered by licensees in the development of operational plans.

# 3. Inventories

### Road and riparian buffers

Over the last 3 years licensees have been using ArcInfo GIS to map important management features. Part of that work has involved the identification of required Forest Practices Code (FPC) reserve and management areas around lakes, wetlands, streams and rivers. Stream and wetland buffers have been developed based on the stream classes and their respective riparian reserve zone widths outlined in the *Forest Practices Code of BC Act* and the *Riparian Management Area Guidebook*. The stream buffers were based on known and inferred stream widths and slope %. The corresponding buffer widths were then added. Currently, the licensees are using this information in their FDP submissions.

Road buffers were developed using current road information and applying specific buffer widths for each road class. The road data comes from the licensee's road data information overlaid with the FC1 road layer.

### Visual landscape inventory

The Visual Quality Classes (VQC's) for the Morice TSA are recommend but not yet approved under the FPC. Visual resources are currently managed using VQC's delineated for the TSA using the most current classification standards. The VQC's will be used in the base case for TSR 2.

### Recreation features

A new recreation inventory was completed in 1998 and is currently a separate inventory, done to Resource Inventory Classification (RIC) standards. In reviewing the management class and feature significance impact on forest operations it was decided locally that only the provincially significant designation (A0) would prevent harvesting from occurring.

### Forest development plans

The FDP's in the database show the most recent submission for existing and proposed harvest blocks. For Canadian Forest Products and the Small Business Forest Enterprise Program (SBFEP) this would be their 1999 FDP and for Houston Forest Products their 1998 submission. These development plans will be used to prioritize harvest in a sensitivity analysis.

### Woodlots

As of 2000, there are a total of 32 approved woodlot licences with corresponding AAC allocations. Approximately half of the original woodlot licensees have been increased in size to 600ha. These woodlots will be excluded from the timber harvesting since their AAC's do not contribute to the AAC of the TSA.

# 4. Division of the Area into Management Zones

## 4.1 Management zones and tracking of multiple objectives (grouping)

In timber supply analysis, management zones are used to differentiate areas with distinct management emphasis. For example, a zone may encompass areas where similar harvesting systems or silviculture systems are used, or areas with a particular visual quality objective or wildlife consideration.

The forest cover data set can also be grouped by different variables to represent often overlapping areas where different management regimes or other factors affect the amount of timber that is available in each area and the rate at which it may be harvested. In addition, the non-contributing forest (land considered unavailable for timber harvesting) may be included for consideration in attaining forest cover objectives. Grouping enables application of management requirements to areas defined by combinations of variables or by combinations of zones. Groups may be thought of as layers of different, often overlapping objectives to be tracked over time. After assessing the available data, the timber supply analyst will determine how the data will be grouped (into groups or mutually exclusive management zones) to best represent the management regimes and emphases that are pertinent to the TSA.

For further information on the forest cover requirements to be applied to each zone and group, see section 6.4, "Integrated Resource Management".

*Table 3. Objectives to be tracked*

| Objectives | Inventory Definition | Function |
|---|---|---|
| Landscape level biodiversity requirements | Non-standard mapped layer | Application of forest age related biodiversity targets at the landscape unit/BEC zone-variant level. All Crown forest included. Reporting purposes to track Old seral targets. |
| Visual quality classes | Standard mapped layer. | To maintain forest cover in areas identified as visually sensitive consistent with each visual quality class and to report on cover status. |
| Integrated resource management area | Areas within the timber harvesting land base not subject to other specified management objectives | Allow application of green-up criteria by landscape unit. |
| Morice River LRUP Zone A | Areas within the timber harvesting land base. | Application of forest cover requirements to reflect the limit of harvesting to address forest health and fire management issues. |
| Telkwa caribou herd recovery area | Non-standard mapped layer | Application of forest cover requirements to forested land within the caribou management zone. |
| Draft landscape units | Non-standard layer | Reporting purposes. Provide an assessment of the total forest by landscape unit. All crown forest included. |

# 4. Division of the Area into Management Zones

Data Source and Comments:

VQC's have been completed for the district. Utilizing the VQC's maintains consistency with the district manager's Visual management policy and with the accepted practices of the district.

The Telkwa caribou herd recovery program area requirements are guided by interim guidelines approved by the District Manager (May, 1999).

## 4.2 Analysis units

An analysis unit represents a combination of stands that grow or are treated similarly. For this analysis, each analysis unit is composed of groups of forest stands that have similar tree species composition (as indicated by the inventory type group) and similar timber growing capability (as indicated by the site index in the forest inventory file). Timber volume projections (yield tables) for existing and future stands will be developed for each analysis unit. The following table describes the analysis unit definitions. After determining the timber harvesting land base, the timber supply analyst will determine the final analysis site index ranges.

Yield tables for existing natural stands will be derived using the variable density yield projection (VDYP) model. Yield tables for recently established plantations and stands regenerated in the future will be developed using the table interpolation program for stand yields (TIPSY).

# 4. Division of the Area into Management Zones

*Table 4. Draft definition of analysis units - existing natural and regenerated stands*

| Analysis Units | Inventory Type Groups | Species | Site Quality | Age Class |
|---|---|---|---|---|
| **Existing Natural Stands** | | | | |
| 111 | 18, 19, 20 | B, BH, BS | Good | >35-140 |
| 112 | 18, 19, 20 | B, BH, BS | Good | >140 |
| 121 | 18, 19, 20 | B, BH, BS | Medium | >35-140 |
| 122 | 18, 19, 20 | B, BH, BS | Medium | >140 |
| 131 | 18, 19, 20 | B, BH, BS | Poor | >35-140 |
| 132 | 18, 19, 20 | B, BH, BS | Poor | >140 |
| 211 | 21, 24, 25, 26 | S, SB, SPI, SDec | Good | >35-140 |
| 212 | 21, 24, 25, 26 | S, SB, SPI, SDec | Good | >140 |
| 221 | 21, 24, 25, 26 | S, SB, SPI, SDec | Medium | >35-140 |
| 222 | 21, 24, 25, 26 | S, SB, SPI, SDec | Medium | >140 |
| 231 | 21, 24, 25, 26 | S, SB, SPI, SDec | Poor | >35-140 |
| 232 | 21, 24, 25, 26 | S, SB, SPI, SDec | Poor | >140 |
| 311 | 28, 30, 31 | PI, PIS, PIDec | Good | >35-80 |
| 312 | 28, 30, 31 | PI, PIS, PIDec | Good | >80 |
| 321 | 28, 30, 31 | PI, PIS, PIDec | Medium | >35-80 |
| 322 | 28, 30, 31 | PI, PIS, PIDec | Medium | >80 |
| 331 | 28, 30, 31 | PI, PIS, PIDec | Poor | >35-80 |
| 332 | 28, 30, 31 | PI, PIS, PIDec | Poor | >80 |
| **Regenerated Stands**** | | | | |
| 113 | 18,19,20 | Balsam leading | Good | <=35 |
| 123 | 18,19,20 | Balsam leading | Medium | <=35 |
| 133 | 18,19,20 | Balsam leading | Poor | <=35 |
| 213 | 21, 24, 25, 26 | Spruce leading | Good | <=35 |
| 223 | 21, 24, 25, 26 | Spruce leading | Medium | <=35 |
| 233 | 21, 24, 25, 26 | Spruce leading | Poor | <=35 |
| 313* | 28, 30, 31 | Pine leading | Good | <=35 |
| 323* | 28, 30, 31 | Pine leading | Medium | <=35 |
| 333* | 28, 30, 31 | Pine leading | Poor | <=35 |

AU Legend:

1st digit = species group (1-3)
2nd digit = productivity rating (G=1; M=2; P=3);
3rd digit = stand class (thrifty = 1; old = 2; managed = 3)

*Site index adjustments will be applied to current and future managed pine stands.

**Regenerated stands reflect all existing managed stands (< 35 years of age) and all stands regenerated in the future.

# 4. Division of the Area into Management Zones

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| 112 | 18, 19, 20 | B, BH, BS | Good | >140 |
| 121 | 18, 19, 20 | B, BH, BS | Medium | >35-140 |
| 122 | 18, 19, 20 | B, BH, BS | Medium | >140 |
| 131 | 18, 19, 20 | B, BH, BS | Poor | >35-140 |
| 132 | 18, 19, 20 | B, BH, BS | Poor | >140 |
| 211 | 21, 24, 25, 26 | S, SB, SPI, SDec | Good | >35-140 |
| 212 | 21, 24, 25, 26 | S, SB, SPI, SDec | Good | >140 |
| 221 | 21, 24, 25, 26 | S, SB, SPI, SDec | Medium | >35-140 |
| 222 | 21, 24, 25, 26 | S, SB, SPI, SDec | Medium | >140 |
| 231 | 21, 24, 25, 26 | S, SB, SPI, SDec | Poor | >35-140 |
| 232 | 21, 24, 25, 26 | S, SB, SPI, SDec | Poor | >140 |
| 311 | 28, 30, 31 | PI, PIS, PIDec | Good | >35-80 |
| 312 | 28, 30, 31 | PI, PIS, PIDec | Good | >80 |
| 321 | 28, 30, 31 | PI, PIS, PIDec | Medium | >35-80 |
| 322 | 28, 30, 31 | PI, PIS, PIDec | Medium | >80 |
| 331 | 28, 30, 31 | PI, PIS, PIDec | Poor | >35-80 |
| 332 | 28, 30, 31 | PI, PIS, PIDec | Poor | >80 |
| **Regenerated Stands**** | | | | |
| 113 | 18,19,20 | Balsam leading | Good | <=35 |
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| 333* | 28, 30, 31 | Pine leading | Poor | <=35 |

AU Legend:

1st digit = species group (1-3)
2nd digit = productivity rating (G=1; M=2; P=3);
3rd digit = stand class (thrifty = 1; old = 2; managed = 3)

*Site index adjustments will be applied to current and future managed pine stands.

**Regenerated stands reflect all existing managed stands (< 35 years of age) and all stands regenerated in the future.

# 4. Division of the Area into Management Zones

Data Source and Comments:

Inventory Type Groups (B.C. Forest Service, Resources Inventory Branch) denote the dominant tree species as well as other species present.

Existing stand analysis units are split by age to facilitate application of old growth site index adjustments to spruce and balsam leading stands (pine adjustments made in the base case). These adjustments for spruce and balsam will be made in sensitivity analysis. Existing natural pine stand analysis units are split <=80 and > 80 years in order to track, and if necessary target harvesting of pine stands to address forest health concerns.

Site index ranges, used to define site productivity, will be mutually exclusive and will be based on the breakdown of the existing range of site indices for each species with the exception of managed pine stands. The site index of Lodgepole pine (*Pinus contorta spp. latifolia* [Engel.] for managed stands (current and future) will be adjusted in accordance with the findings of the publication "The Effects of Stocking on Estimated Site Index in the Morice, Lakes and Vanderhoof Timber Supply Areas in Central British Columbia."

The following equations apply to managed pine stands in the Morice TSA, as per pg. 16 of the above noted publication:

1) SBSdk sites : MSI = NSI + 14.243 – 0.606*NSI (NSI 20.00) and
2) SBSmc2 sites: MSI = NSI + 17.807 – 0.931*NSI (NSI 19.12).
   - MSI = Managed stand site index
   - NSI = Natural stand site index

Stands younger than 35 years of age are assumed to be managed. Overstocked stands less than 35 years of age will have been spaced to a density between 1200 and 1800 sph (average 1500 sph), justifying assignment of these stands to managed stand yield tables (MYST).

In a sensitivity analysis, old growth site index adjustments will be applied to spruce and balsam leading stands as per Working Paper 36, *Site Index Adjustments for Old-Growth Stands Based on Paired Plots* and Working Paper 37, *Site Index Adjustments for Old-Growth Stands Based on Veteran Trees*.

# 5. Timber Harvesting Land Base Definition

## 5.1 Identification of the timber harvesting land base

For this analysis the Morice TSA area will be divided into the areas where timber harvesting will take place (the timber harvesting land base), areas where trees do not grow and areas where trees grow but where timber harvesting will not take place. This section outlines the steps used to identify the timber harvesting land base.

Land may be unavailable for timber harvesting for three principal reasons:

- It is not administered by the Forest Service for timber supply purposes (e.g., private land, parks, etc.).
- It is not suitable for timber production.
- It is unavailable for timber harvesting.

Land may also be added to the timber harvesting land base:

- By management activities which improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush).
- By the acquisition of productive forest land (e.g., timber licence reversions).

## 5.2 Classification of the timber harvesting land base

The classification of "unavailable for timber harvesting" applies only to land where no harvesting is expected to occur. Any area in which timber harvesting occurs will remain in the timber harvesting land base, even if harvesting activities will be subject to stringent constraints. Any such constraints will be included in the analysis, if possible.

When determining the timber harvesting land base (THLB), all areas where timber harvesting is not expected to take place are deducted from the total land base. Then lands that are expected to become suitable or available for timber harvesting through management or land acquisition are added. The resulting area is defined as the "current timber harvesting land base" for the TSA.

### *5.2.1 Land not administered by BC Forest Service for timber supply purposes.*

Some lands encompassed by the TSA boundary do not form part of the TSA. They include, for example, private lands, federal lands such as Indian reserves, tree farm licences and woodlot licences. These lands do not contribute to the timber supply of the TSA.

In the inventory, lands under various ownership's or subject to different government administration are identified by ownership codes. Areas labelled with ownership codes 61C, 62C and 69C are crown land and miscellaneous reserves respectively that may contribute to the timber supply of a TSA.

As described above, areas under woodlot licenses are not administered as part of the Morice TSA. Their allowable annual cut (AAC) is determined and administered independently.

In the Morice TSA, 32 woodlot licenses have been issued. The total area associated with the 32 woodlots is 18287.3 ha and this area will be excluded from the Morice TSA land base. The harvest attributed to the crown land in woodlot licenses is 40753 $m^3$/year.

### 5.2.2 Agricultural leases

Agriculture leases will be removed from the timber harvesting land base. Agricultural leases are identified as '88' under the ALR variable on the inventory file.

### 5.2.3 Land classified as non-forest

Areas in the Alpine Tundra biogeoclimatic zone and areas labelled in the inventory with type identity 6 and 8 are areas such as alpine, lakes, rocks etc. and are removed from the land base considered for timber supply.

Areas labelled in the inventory with type identity 5 are covered with non-commercial brush species. These areas are usually not suited for timber production and are removed from the land base considered for timber supply.

### 5.2.4 Recreation

Areas identified from the recreation inventory and coded, as "A0" are entirely removed from contributing to the timber supply.

### 5.2.5 Environmentally sensitive areas

Some forestlands are environmentally sensitive and/or significantly valuable for other resources. These areas are identified and delineated during a forest inventory as environmentally sensitive areas (ESAs). The following sensitive areas are included in the ESA classification system: soils (Es), forest regeneration problems (Ep), snow avalanche (Ea), recreation (Er), wildlife (Ew), and water (Eh). Each ESA category may be identified as being either highly or moderately sensitive to timber harvesting activities.

Management practices in ESA areas may result in a reduction in the harvesting opportunity on these sites.

For timber supply analysis two methods for accounting for this are employed: percent area reductions, and the specific evaluation of individual ESA polygons for harvesting opportunity.

As noted previously, only those areas in which harvesting is expected to take place are included in the timber harvesting land base. Table 5 identifies the percentage of each ESA classification that in this analysis is assumed to be unavailable for harvesting and will therefore not be included in the timber harvesting land base.

*Table 5. Description of environmentally sensitive areas (in FC1/FIP)*

| ESA Category | ESA Description | Reduction percent |
|---|---|---|
| Er1 | The non-corporate recreation features and the visual sensitivity class inventories will replace the recreation data contained in the FC1/FIP files. | 0% |
| Es1 | Sensitive soils | 100% |
| Ep1 | Areas where forest regeneration is difficult | 100% |
| Ea1 | Avalanche areas | 100% |
| Ew1 | Sensitive wildlife areas | 100% |
| Es2 | Sensitive soils – high elevation, flat, wet sites | 20% |

Data Source and Comments:

The reduction percentages are the same as those used in the 1996 analysis with the exception of the recreation information.

A 20% reduction was applied to the ES 2 designation since it is unlikely that all the high elevation, flat wet sites are being harvested.

No land base reduction will be applied to the remaining areas covered with a moderate ESA designation because harvesting occurs in these designations

Level D terrain stability mapping (TSM) was completed for the Morice TSA in 1998 with a report comparing the TSM polygons and ESA s1 and s2 polygons. In the report, it was noted that with slight differences, the ESA classification for soils included all or portions of unstable terrain and was accurate for the TSA. Staff decided to use the forest cover mapping in the analysis and therefore the existing ESAs in the FC1/FIP files will be used in the analysis in place of the Level D terrain stability mapping.

### *5.2.6 Operability considerations*

Operability categories are generally based on the presence or absence of physical barriers or limitations to harvesting, logging methods (e.g. cable) and the merchantability of stands. In the previous analysis the need was identified to improve on operability information for the Morice TSA. This was addressed through a operability mapping project carried out in the Morice TSA in 1999.

Operability mapping was developed for the Morice TSA using slope information provided in the TRIM data and will be used in the analysis to examine the harvest contribution from each class in the base case harvest forecast. The following slope classes were identified:

- conventional 0-39.9 %,
- mixed 40.0 -59.9 % and
- other > 60.0%+.

Inoperable areas are identified within the FIP files standard variables (IN_OP). In addition, MOF Staff reviewed block coverage on areas above the 1360-meter (4000') contour interval. Only a portion of a few blocks went higher than the 1360-m elevation line. It was determined that stands below the elevation line of 1360 m are commonly harvested as current district practices, and stands above 1360m are generally not, and would be classified as inoperable (identified within the OPERABILITY layer). Therefore stands above 1360 metres in elevation, and the area associated with the standard FIP IN_OP variable will be removed from the timber harvesting land base.

### *5.2.7 Non-merchantable forest types*

Non-merchantable forest types are stands which are physically operable but not utilized in the Morice TSA. In the Morice TSA these types are excluded from the timber harvesting land base. The non-merchantable forest types for the Morice TSA are as shown in Table 6.

# 5. Timber Harvesting Land Base Definition

*Table 6. Non-merchantable forest types excluded from the Morice TSA timber harvesting land base*

| Existing Species | Inventory Type Group Code | Percent reduction (%) |
|---|---|---|
| Fir | 1-8 | 100 |
| Cedar | 9-11 | 100 |
| Hemlock | 12-17 | 100 |
| Spruce/fir | 22 | 100 |
| Spruce/hemlock | 23 | 100 |
| Western white pine | 27 | 100 |
| Lodgepole pine/fir | 29 | 100 |
| Yellow pine | 32 | 100 |
| Larch | 33-34 | 100 |
| deciduous | 35-42 | 100 |

The definition of non-merchantable types is the same as that used in the previous analysis. Areas will be excluded on the basis of current practice. These species will not contribute to the base case timber supply of the Morice TSA. Also some tree species are not common in the District (e.g. Western Whitebark pine) or they are in remote locations with difficult access (e.g. western hemlock in the Southwestern portion of the TSA).

### 5.2.8 Sites with low timber growing potential

Sites may exhibit low timber growing potential either because of inherent site factors (nutrient availability, exposure, excessive moisture, etc.), or because they are not fully occupied by commercial tree species. Typically, these stands are intermixed with other stands within the forested land base. As these stands are not considered to be harvestable, they need to be identified and excluded from the timber harvesting land base with the exception of any stand with and a history of logging. If logging has occurred historically, it will be assumed it can be harvested again.

*Table 7. Description of Sites with low timber growing potential*

| Existing Natural Stands | Leading Species | Characteristics* | | | |
|---|---|---|---|---|---|
| | | Age >= | Volume <= | Site Index | Reduction |
| Inventory Type Group | | (years) | ($m^3$/ha) | (m) | % |
| 18,19,20 | Balsam | 200 | 200 | < 9.1 | 100 |
| 21,24,25,26 | Spruce | 150 | 150 | < 8.0 | 100 |
| 28,30,31 | Pine | 150 | 150 | < 9.1 | 100 |

* all stands not achieving a growth rate of 1 $m^3$/yr, at the age specified in Table 7, are removed from the timber harvesting land base.

Data Source and Comments:

Criteria defining low site stands evolved out of those used in the previous timber supply analysis process. The minimum volume must be achieved by the age specified in Table 7 for a stand to be considered productive enough to be managed for timber supply. Together, these two criteria (volume and age) are compared to natural stand yield curves to define the minimum site index. The resulting minimum site index will then be compared to the site index on the FIP file and those below the minimum will be removed from the THLB. The low site criteria will be applied to all age class with the exception of stands with logging history.

### *5.2.9 Riparian reserve and management zones*

District-wide stream, river, lake and wetland buffer widths have been completed since the last TSR. Appropriate reserve zone buffers have been applied to stream classes S1, S2 and S3 streams as per FPC requirements. The area identified as being within these riparian reserve zone (RRZ) buffers will be removed from the timber harvesting land base. The gross area for RRZ buffers is 70,169 ha (variable coded as RIV_HA, STR_HA, LAKE_HA, WET_HA).

The current management practice for riparian management zones (RMZ's ) on stream class S1, S2 are to leave them intact unless forest health activities require harvesting of small areas. The gross area for all RMZ's on streams is 9881 ha. To account for RMZ's on SI and S2 streams only, 85% of the net area associated with RRZ's for rivers (RIV_HA) will be removed from the timber harvesting land base. The other 15% of the net area associated RRZ's is associated with stream classes S3 and S4.

For RMZ's associated with riparian features stream classes S3 and S4, all merchantable stems are harvested leaving only non-merchantable and smaller diameter stems. For the analysis these riparian management zones will remain in the timber harvesting land base and will be harvested.

### *5.2.10 Roads, trails and landings*

District-wide road, trails and landings have been identified spatially since the last 1996 analysis. The area associated with the road buffers will be removed from the timber harvesting land base.

Existing roads, trails and landings have been identified and buffered for the TSA in a non-standard inventory layer (See Section 3.0, Inventories).

# 5. Timber Harvesting Land Base Definition

*Table 8. Area reduction for existing and future roads*

| Road Class | % TSA roaded -LU's removed | Road Buffer Width (m) | Area Reduction (ha.) |
|---|---|---|---|
| **Existing RTL's** | **ocular estimate** | | |
| Secondary | 70 | 30 | 451* (2251) |
| Logging | 40 | 10 | 4655* (5806) |
| Trails | 30 | 5 | 1054 *(1485) |
| Landings | 29% THLB harvested | | 3854** |
| **Future RTLs (est)** | | | |
| Secondary | 30 | 30 | 193* |
| Logging | 60 | 10 | 6983* |
| Trail | 70 | 5 | 2459* |
| Landings | 71% THLB remaining | | 9436.0** |

* Estimated reduction to the THLB. Actual area removed for roads will be reported in the analysis. Area in brackets is the total area effected by roads within the TSA including area outside the timber harvesting land base.

** See discussion below for calculation method.

Data Source and Comments:

***Roads and trails***

The amount of existing roaded area within the TSA has been determined from a GIS analysis in our non-standard inventories list. The roads were identified and classified as secondary, logging and trail. An appropriate buffer width was then attached to each class of road (see Table 8). The area for each road class was calculated exclusive of landings. This results in a total reduction for existing roaded areas from the timber harvesting land base. These summaries do not include roads within landings.

For reductions to future roads, a map of the roaded portions of the district was used to estimate the % of the area currently roaded and the % that would be roaded in the future.

***Landings***

An ISIS report current to 1998 shows that there was approximately 4.2% of each opening with a harvesting history was associated with roads and landings.

It is estimated in the TSA that 50% of the opening is due to roads and are accounted for, therefore [4.2% x .5] x 183 528 ha (gross area associated with openings) = 3854 ha associated with in-block landings for the TSA.

For future reductions due to landings we assumed that 29% of the land base or 183528 ha has been harvested. The total disturbance due to landings for the THLB is 13290 = (3854 ha/29%) therefore 71% of the total disturbance is 9436 ha.

### 5.2.11 Deferrals

All parks and reserves designated by Order-In-Council (OIC) will be excluded from the timber harvesting land base.

There are ten areas proposed for protection under the protected area strategy (PAS) within the TSA. They are the Burnie Lakes, Nanika-Kidprice, Telkwa Range, Atna Lake, Babine Lake sites (4 small lake shore sites), Nadina Mountain and Old Man Lake/China Nose. These areas have been designated by order in council as Official Study Areas. These areas have not been designated as official parks but are deferred from commercial harvesting by a Cabinet order in council. Until a final decision is made as to their adoption as official PAS areas, any industrial activity is limited by the Interim Management Guidelines for the Prince Rupert Forest Region.

The base case will assume PAS official study areas are still harvestable but are deferred for the next 10 years. A sensitivity analysis will test the impact of deferring harvest in PAS areas for the next 10 years and retaining only 50% of the timber harvesting area associated with the PAS thereafter. The other 50% of the timber harvesting area associated with the PAS will be permanently removed as it is likely that about half of the official study areas will become officially designated protected areas.

### 5.2.12 Cultural heritage resource considerations

In recent years numerous areas with cultural heritage resources have been noted. These include culturally modified trees (pre and post 1846), cache pits, village sites and trails. These areas generally overlap with wildlife tree patches, riparian management areas, problem forest types or other removals from the timber harvesting land base. No further reductions will be made for cultural heritage resources in the base case analysis.

### 5.2.13 Areas unavailable for harvest due to economic constraints

District staff reviewed all landscape units with respect to economic constraints. Staff concluded that all or a part of the landscape units identified in Table 9 would not be accessed in the future due to high development costs and low value of stands. In the base case, the portion of the landscape units identified in Table 9 will be removed from the timber harvesting land base.

*Table 9. Areas unavailable to harvest due to high development costs*

| LU | Allocated | Licensee | % thlb not available |
|---|---|---|---|
| Troitsa | N | unallocated | 62 |
| Sibola | N | unallocated | 74 |
| Nanika* | N | Unallocated/PAS | 100 |
| Morice Lake | Y | Partially CANFOR/SBFEP | 50 |
| Burnie* | N | unallocated | 100 |

Comments:

District staff reviewed all landscape units with respect to economic constraints. An interim timber harvesting land base map and analysis was used to identify the proportion of the area within landscape units that staff felt would not be accessed. These isolated areas of harvestable timber would require long and costly road building distances over steep terrain, with numerous stream crossings and would result in extremely high development costs relative to the value of timber being accessed. In the base case analysis, every polygon within the landscape units identified in Table 9 will be reduced by the corresponding proportion.

# 6. Current Forest Management Assumptions

## 6.1 Harvesting

### 6.1.1 Utilization levels

The utilization levels define the maximum stump height, minimum top diameter (inside bark) and minimum diameter at breast height by species. The utilization levels are used in the analysis to calculate merchantable volume.

*Table 10. Utilization levels*

| Analysis unit | Minimum dbh (cm) | Utilization Maximum Stump Height (cm) | Minimum Top dib (cm) |
|---|---|---|---|
| Lodgepole Pine | 12.5 | 30.0 | 10.0 |
| Balsam | 17.5 | 30.0 | 10.0 |
| Spruce | 17.5 | 30.0 | 10.0 |

Data Source and Comments:

Table 10 reflects existing license requirements and current performance.

### 6.1.2 Volume exclusions for mixed species stands

In practice deciduous leading stands are not harvested in the Morice TSA and are thus excluded from the land base (see section 5.2.7, "Non-Merchantable Forest Types"). Deciduous volume within conifers leading stands are also not harvested in practice and therefore the deciduous volume within coniferous stands will be excluded from the yield tables used in the analysis.

*Table 11. Volume exclusions for mixed species types*

| Inventory Type Group | Species | Volume Exclusion (%) |
|---|---|---|
| All coniferous leading | Deciduous | 100 |

### 6.1.3 Minimum harvestable age derivation

The minimum harvestable age is the time required for a stand to grow to a harvestable size. Minimum harvestable ages are minimum criteria. While harvesting may occur in stands at the minimum age to meet forest level objectives (e.g. maintaining overall harvest levels for a short period of time or avoiding large changes in harvest levels), most stands will not be harvested until past the minimum age due to management for other resource values taking precedence (e.g. requirements for the retention of older forest).

# 6. Current Forest Management Assumptions

*Table 12. Minimum harvestable criteria by analysis unit –existing stands*

| AU | Leading Species | Minimum Volume ($m^3$/ha) |
|---|---|---|
| 111 | Balsam leading | 200 |
| 112 | Balsam leading | 200 |
| 121 | Balsam leading | 200 |
| 122 | Balsam leading | 200 |
| 131 | Balsam leading | 200 |
| 132 | Balsam leading | 200 |
| 211 | Spruce leading | 150 |
| 212 | Spruce leading | 150 |
| 221 | Spruce leading | 150 |
| 222 | Spruce leading | 150 |
| 231 | Spruce leading | 150 |
| 232 | Spruce leading | 150 |
| 311 | Pine leading | 150 |
| 312 | Pine leading | 150 |
| 321 | Pine leading | 150 |
| 322 | Pine leading | 150 |
| 331 | Pine leading | 150 |
| 332 | Pine leading | 150 |

AU Legend:
1st digit = species group (1-3)
2nd digit = productivity rating (G=1; M=2; P=3);
3rd digit = stand class (thrifty = 1; old = 2; managed = 3)

# 6. Current Forest Management Assumptions

*Table 13. Minimum harvestable criteria by analysis unit – regenerated stands*

| AU | Leading Species | Minimum Volume ($m^3$/ha) |
|---|---|---|
| 113 | Balsam leading | 200 |
| 123 | Balsam leading | 200 |
| 133 | Balsam leading | 200 |
| 213 | Spruce leading | 150 |
| 223 | Spruce leading | 150 |
| 233 | Spruce leading | 150 |
| 313 | Pine leading | 150 |
| 323 | Pine leading | 150 |
| 333 | Pine leading | 150 |

AU Legend:
1st digit = species group (1-3)
2nd digit = productivity rating (G=1; M=2; P=3);
3rd digit = stand class (thrifty = 1; old = 2; managed = 3)

Data Source and Comments:

The minimum volume criteria will be used to generate minimum harvest ages that represent the current understanding of minimum merchantability in the Morice TSA. The minimum volume criteria are the same as those used to derive minimum site index values (see section 5.2.8, "Sites with low timber growing potential"). The minimum harvest age is defined as the age at which the minimum volume is reached on the corresponding yield curve for each analysis unit. Ages will be determined once yield curves are derived for each analysis unit.

### *6.1.4 Harvest scheduling priorities*

Managing forest health (bark beetle) issues in the TSA is currently based on a hazard and risk rating methodology developed in the Morice District and the Bark Beetle Strategy (approved by the District Manager). The hazard and risk rating uses stand composition, age and diameter based on site index, stand density, slope/aspect and location (elevation, latitude and longitude). The hazard rating identifies those stands most susceptible to attack by beetles. The risk rating is based on actual infestations reported in the stand and a distance from the infestation site that poses a risk to the surrounding stands. In general, bark beetles will attack stands that are older and on better quality growing sites

In modeling the stands likely to be attacked by bark beetles, the district in discussion with the TSR analyst, have chosen an approach called relative oldest first. Using the relative oldest harvest rule, the timber supply model will pick from stands available for harvest by comparing the difference between minimum harvest age and current stand age. The stands with the biggest difference will be harvested first.

# 6. Current Forest Management Assumptions

As an example consider two pine stands, one with a minimum harvest age of 80 years and current age of 150 years (difference 70 years) and a second stand with a minimum harvest age of 80 years and current age of 120 years (difference 40 years). The stand with the 70-year difference would be harvested first.

Using the relative oldest harvest rule generally results in higher productivity stands being harvested before poorer sites as minimum harvest ages will be lower for higher sites. In addition, balsam sites require more volume to be merchantable than pine, resulting in higher minimum harvest ages. This generally means that pine sites will be harvested first followed by spruce and balsam sites.

If after reviewing the base case harvest pattern it is decided that the relative oldest harvest rule is not harvesting stands relative to their health risk, existing stand analysis units will be prioritized for harvest individually. For a more detailed look at the criteria used to rate forest stands for hazard and risk refer to the 'Bark Beetle Strategy Morice Forest District January 1, 2001'.

### *6.1.5 Silvicultural systems*

Clearcut with reserves is the predominant silvicultural system in use in the Morice TSA. Under this system a range of patch sizes (1 ha to several hundreds of ha) of even-aged forest is being produced. Cutting of adjacent blocks is restricted until green-up (e.g. integrated resource management (IRM) zone, 3 meters) conditions are met, unless otherwise specified by the District Manager. A characteristic of this system is the maintenance of older forest remnants within harvest blocks. These remnants are intended to function as wildlife tree patches, riparian reserves and management zones, and island remnants to conserve old growth characteristics.

Data Source and Comments:

All records from the ISIS-harvest activity table of the district database with a disturbance date post-1995 to reflect 'current management practices'. The information produced covered 21,897 ha. of harvesting from 610 openings. Retention for reserves (riparian, WTP's, etc.) are captured under their respective sections of the data package.

## 6.2 Unsalvaged losses

Unsalvaged losses are those unutilized timber volumes in the timber harvesting land base destroyed by insects, fires, wind or other natural agents.

### *6.2.1 Unsalvaged losses for the first 50 years of the analysis*

Table 14a shows the estimated average annual unsalvaged volume losses to insect, blowdown and fire events for the next 50 years. The unsalvaged loss column reflects only those areas in which the volume will not be recovered.

# 6. Current Forest Management Assumptions

*Table 14a. Unsalvaged losses for the first 50 years*

| Cause of Loss | Total Loss ($m^3$/yr) | Annual Unsalvaged Loss ($m^3$/yr) |
|---|---|---|
| Fire | 24 500 | 11 000 |
| Wind | 15 000 | 8 000 |
| Mountain pine beetle<br>Avg. over 5 years | 150 660 | 9 050+59 796*= 68 846 |
| Spruce bark beetle<br>Based on 2000 overview flight | 946 687 | 293+30 017*=30 310 |
| Balsam bark beetle | 63 703 | 63 703* |
| **Total** | | **171,959** |

* Grade 3 volumes for 1996 to 2000 for Pine, Spruce and balsam.

Data Source and Comments:

Fire

To calculate unsalvaged fire losses for this analysis, staff reviewed the years from 1996 –2000 for fire losses. Of the few fires that have occurred, all damaged timber had been salvaged. As harvesting activities provide increased access to forested areas the risk for a man-made fire increases but the ability to suppress fire due to increased access combined with improved protection activities was felt to decrease overall fire risk and associated losses due to fires. As the older higher fire hazard stands are harvested first, the forest's age class structure will change slowly over time. Overall, staff felt that the amount of unsalvaged fire losses would be significantly less then that the figure used in the 1996 analysis, resulting in staff reducing unsalvaged fire losses by 50% to 11 000 $m^3$/yr.

Wind

Losses due to wind damage were kept the same as in the 1996 analysis.

Insects

In the Morice TSA, harvesting activities have been targeting Mountain Pine Beetle (MPB) for more then 10 years and Spruce Bark Beetle (SBB) for the past 2 years. Losses of timber volumes are addressed through non-recoverable losses, which reflect the epidemic loss less any salvaged volume

A bark beetle infestation in a susceptible stand kills live trees. These trees, if in the THLB need to be accounted for otherwise they would be assumed to be alive and harvestable in a timber supply analysis. Typically stands of dead trees that are harvested 3 years after death are classified as grade 3 (dry sawlog) timber. Trees harvested between 3 -5 years after being killed are classified as grade 5 (pulpwood) timber. If a harvesting permit is not coded as catastrophic and the trees are harvested, then the harvested volume does not count towards the licensee's AAC. To account for trees harvested in this manner, this analysis will treat that volume as unsalvaged losses.

An analysis of the scale returns for 1996 to 2000 for pine, balsam and spruce showed that, with the exception of the Small Business Forest Enterprise Program, grade 3 volumes are not charged against the AAC. There is a portion of grade 3 volumes that is attributable to endemic losses, not counted against the AAC, and a portion that is epidemic and would count against AAC. Currently the district is attempting to clarify what is endemic, and what is epidemic grade 3 volume to ensure volume is charged appropriately.

# 6. Current Forest Management Assumptions

### 6.2.2 *Unsalvaged losses after the first 50 years of the analysis*

*Table 14b. Unsalvaged losses after 50 years*

| Cause of Loss | Total Loss M3/yr | Annual Unsalvaged Loss ($m^3$/yr) |
|---|---|---|
| Fire | 24500 | 11 000 |
| Wind | 7000 | 4 000 |
| Insects | | 89 572 |
| **Total** | | **104 572** |

Data Source and Comments:

Wind

Between 1996-2000, the district experienced few windthrow events. As we continue to harvest older stands over the next 50 years the forest will become younger over time. Staff felt that the younger stands would be more windfirm although increased access would provide more edges that could potentially blowdown. Overall, although windthrow is currently not tracked, staff assumed that there would be lower losses in the future. Therefore the losses from wind damage projected for the remainder of the planning horizon were assumed to be 50% of what they were during the first 50 years.

Fire

The unsalvaged fire losses projected for the remainder of the planning horizon were assumed to be the same as those proposed for the first 50 years.

Insects

A brief analysis below shows that an area equal to approximately 55% of what is currently susceptible to insect losses (stands >80 years of age) will remain after 50 years of harvest, assuming current harvest levels.

**TSR1 THLB = 634 341 ha**

- 50 years of harvesting at 1 995 000$m^3$/yr / average harvest of 350 $m^3$ /ha = 285 000 ha (5 700 ha/yr * 50 yrs).
- Total susceptible area in 50 years without any harvesting equals [stands > 80 years now + stands currently aged 30 to 80 years (will be > 80 years in 50 years) = 467 312 ha + 76 487 ha] = 543 799 ha.
- Future susceptible area equals [Total susceptible area in 50 years - Total area harvested in 50 years] = 543 799ha – 285 000ha = 258 799 ha
- In 50 years the percentage of susceptible stands relative to today will be (258 799 ha (susceptible area 50 years from now) / 467 313 ha (susceptible area today) * 100%) = 55%.

To provide an estimate of future insect attack, staff prorated insect losses in 14a to reflect the proportion of future susceptible area relative to current susceptible area (68 846 m3+30 310 m3+63 703 m3) = 162 859 m3 * 55% = 89 572 m3.

The future losses will be recalculated as detailed above once the area within the THLB and corresponding age class distribution are determined for this analysis.

# 6. Current Forest Management Assumptions

*Table 14c. Age class distribution and harvest assumptions used in future unsalvaged losses estimates*

| Class Distribution | THLB Area | % |
|---|---|---|
| 0 to 30* | 90 541 | 14.3 |
| 30* to 80* | 76 487 | 12.1 |
| >80* | 467 312 | 73.7 |
| Totals | 634 341 | 100.0 |

* area was split between classes.

| | | |
|---|---|---|
| AAC | | 1 395 000 |
| avg. m3/ha | | 350 |
| avg. area harv/yr | 5 700 | |
| Area harvest over next 50yrs (forecast based on current AAC) | 285 000 | |

Data Source and Comments:

### 6.2.3 To calculate total loss ($m^3$/year)

Unsalvaged losses are calculated by two methods:

1) taking the average number of trees treated by fall and burn and MSMA (pesticide) per year over the past 5 years across the THLB and multiply by 0.5 $m^3$ for pine and .75 $m^3$ for spruce (average piece size for the TSA) to determine unsalvaged losses m3/year. Once the percentage of the THLB that is going to be netted out such as riparian reserve zones, ESA's and stand/landscape level biodiversity requirements, the unsalvaged losses can be multiplied by this percentage to determine what unsalvaged losses actually occurred in the THLB.
2) Add to 1 above the grade3 scale return volumes for pine, spruce and balsam as attributable to unsalvaged losses due to bark beetle attack.

### 6.2.4 Mountain pine beetle (MPB)

Calculate total number of red trees based on annual GPS overview flight data.

Multiply number of reds by the red/green ratio for that given year.

This will determine total loss of trees per year. Take the average of trees lost per year over a certain period of time (i.e. 5 years) and multiply by 0.5 $m^3$ (average piece size) to determine the total loss $m^3$/year.

### 6.2.5 Spruce bark beetle (SBB)

Calculate total number of red trees based on annual GPS overview flight data.

Multiply number of reds by the red/green ratio for that given year.

This will determine total loss of trees per year. Take the average of trees lost per year over a certain period of time (i.e. 5 years) and multiply by 0.75 $m^3$ (average piece size) to determine the total loss $m^3$/year.

### 6.2.6 Western balsam bark beetle (BBB)

With the exception of grade 3 volumes, western balsam bark beetle losses are considered to be included in VDYP yield predictions for natural stands due to their dispersed (endemic) nature of attack. For the purposes of TSR 2 the District initiated a study in the summer of 2000 to compare the net merchantable volume derived from timber cruises in higher elevation balsam stands with VDYP yield predictions to determine if those mortality estimates caused by this beetle are sufficiently accounted for. The results of the study will be considered once they are available.

## 6.3 Silviculture

### 6.3.1 Regeneration activities in managed stands

Recent plantations and future stands will be grown on managed stand yield tables (MSYTs) produced using the B.C. Forest Service Table Interpolation Program for Stand Yields (TIPSY) growth and yield model. A final analysis unit MSYT will be built from a number of yield tables as more than one regeneration regime is used within an analysis unit (see Table 15).

The silviculture program reflects the mix of treatments expected to be carried out according to the Morice TSA Plan. This level of activity assumes basic silviculture on all sites plus incremental silviculture on some sites. Table 15 shows the regeneration assumptions by analysis unit for future stands, existing operable, not satisfactorily restocked (NSR) areas, and young plantations that have been managed for density.

As discussed in the chief forester's 1996 AAC rationale report, a paired-plot study undertaken in the Lakes and Morice TSAs has provided scientifically derived, statistically reliable estimates of site productivity for this TSA, confirming the site index underestimation for managed lodgepole pine stands in this area. The results of this study — *The Effects of Stocking on Estimated Site index in the Morice, Lakes and Vanderhoof Timber Supply Areas in Central British Columbia* by James W. Goudy 1996 — will be used to adjust the area-weighted mean site index for regenerated pine analysis units within the SBS biogeoclimatic zone.

# 6. Current Forest Management Assumptions

*Table 15. Regeneration assumptions by analysis unit*

| Existing Analysis Units | Regeneration Analysis Units | Species Composition | Regen Delay | OAFs[a] % | | Method | | Species | | Initial Density Stems/ha |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | Type | % | code | % | |
| 111,112,121,122, 131,132 | 113,123,133 | Balsam Leading | 2 yrs. | 15 | 5 | Plant | 100 | S8P2 | 16 | 1500 |
| 111,112,121,122, 131,132 | 113,123,133 | Balsam Leading | 2 yrs. | 15 | 5 | Plant | 100 | S5P5 | 23 | 1500 |
| 111,112,121,122, 131,132 | 113,123,133 | Balsam Leading | 2 yrs. | 15 | 5 | Plant | 100 | P8S2 | 61 | 1500 |
| 211,212,221,222, 231,232 | 213,223,233 | Spruce Leading | 2 yrs. | 15 | 5 | Plant | 100 | S8P2 | 10 | 1500 |
| 211,212,221,222, 231,232 | 213,223,233 | Spruce leading | 2yrs. | 15 | 5 | Plant | 100 | S5P5 | 55 | 1500 |
| 211,212,221,222, 231,232 | 213,223,233 | Spruce leading | 2yrs. | 15 | 5 | Plant | 100 | P8S2 | 35 | 1500 |
| 311,312,321,322, 331,332 | 313,323,333 | Pine leading | 2 yrs. | 15 | 5 | Plant | 100 | P8S2 | 49 | 1500 |
| 311,312,321,322, 331,332 | 313,323,333 | Pine leading | 2 yrs. | 15 | 5 | Plant | 100 | P5S5 | 51 | 1500 |

AU Legend:
1st digit = species group (1-3)
2nd digit = productivity rating (G=1; M=2; P=3);
3rd digit = stand class (thrifty = 1; old = 2; managed = 3)

(a) Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational conditions. OAF 1 is a constant percentage reduction to account for small unproductive areas within stands, uneven stem distribution, endemic losses and other random risk factors such as snow press. OAF2 increases over time, in this case at 5% per 100 years, accounting for decay waste and breakage.

Data Source and Comments:

The species composition column in Table 15 refers to the leading species of the existing natural stands before harvest and regeneration. All values in Table 15 are based on current regeneration practices as determined by Morice Forest District staff using ISIS reports. It is assumed that all stands under the age of 35 are managed.

The species composition of regenerated stands after planting are assumed to be:

**Balsam leading stands are being regenerated to**

- a pine leading stand (Pli80Sx20) 61% of the time,
- a mix of pine and spruce (Pli50Sx50) 23% of the time and
- a leading spruce stand (Sx80Pli20) 16% of the time.

# 6. Current Forest Management Assumptions

**Spruce leading stands are being regenerated to**

- a spruce/pine mix (Sx50Pli50) 55% of the time,
- a spruce leading (Sx80Pli20) 10% of the time and
- a pine leading stand (Pli80Sx20) 35% of the time.

**Pine leading stands are being planted to**

- a pine/spruce (Pli50Sx50) 51% of the time and
- a pine leading (Pli80Sx20) 49% of the time.

Regeneration delay, called Regen delay in the table, for the district has been determined to be 2 years. The age of the stock being planted is 1 year old. Therefore, effective regeneration delay is 1 year (2 years to plant the block (regen delay) minus 1 year to account for seedling age = 1 year) and will be modelled in the analysis.

Existing overstocked immature stands are assumed to be treated for density control to a range of density between 1200 and 1800 sph and are assumed to follow the regenerated analysis units yield curves.

### *6.3.2 Planted areas with class A stock*

*Table 16. Historic planting of A and B class spruce seedlings*

| Predicted gain % | % of Seedlots used | Stems planted |
|---|---|---|
| Class B+0 | 37.10% | 5161813 |
| Class A+0 | 17.50% | 2432340 |
| Class A+02 | 0.03% | 3900 |
| Class A+03 | 35.50% | 4940747 |
| Class A+04 | 9.30% | 1293619 |
| Class A+08 | 0.20% | 27075 |
| Class A +18 | 0.50% | 67440 |
| Total | 100% | 13926934 |
| **Average Gain** | **2.4%** | |

Total 13926934 seedlings 31790.3 ha planted
Average of 439.4 stems /ha TSR 2 assumption is 1500 s/ha

No improved lodgepole pine seed has been planted in the TSA. The ISIS extracted data represents all spruce seedlots used in one or more plantings of each opening since June 1995. The discrepancy between the average number of stems planted and the total assumed in TSR is a function of the planting of multiple species on a single site.

In the base case no gain will be assumed for improved seed as gains are small (< 0.6% TSA wide). A sensitivity analysis will examine the inclusion of a 2.4% gain for spruce planted in the past 5 years and all future spruce stands.

### 6.3.3 Immature plantation history

This section identifies areas of existing immature forest where the density (stems per hectare) has been controlled, justifying alignment of these stands to managed stand yield table (MSYT).

*Table 17. Natural stands with density control*

| Leading Species | Area treated (ha) |
|---|---|
| Pine | 1965 ha |

Data Source and Comments:

Some pine stands younger than 35 years have not been planted, but due to density control will be considered managed. Spruce and balsam are not represented in this table as they generally does not require density control. All stands less then 35 years of age will be considered managed in this analysis.

### 6.3.4 Not satisfactorily restocked (NSR) areas

Some land classified in the Morice TSA FIP file as type identity 4 or 9 is included in the current timber harvesting land base. These type identities indicate *not satisfactorily restocked* land base. The purpose of this section is to identify the total area of NSR currently existing in the timber harvesting land base, and the estimated rate at which the NSR area will be restocked. If the figures provided in this table (from district silviculture records) differ from the NSR area showing on the inventory file, the figures in this table will be prorated to match the inventory file.

*Table 18. Not satisfactorily restocked (NSR) areas*

| Leading Species | Total Area (ha) | Current area NSR | Backlog NSR Treated | Backlog NSR Not Treated |
|---|---|---|---|---|
| Balsam | 1894.8 | 1785.7 | 0 | 109.1 |
| Spruce | 2109.8 | 1430.4 | 323.3 | 356.1 |
| Pine | 11121.3 | 6317.9 | 2802.3 | 2001.1 |
| **Total** | **15125.9** | **9534** | **3125.6** | **2466.3** |

Data Source and Comments:

- NSR information provided in Table 18 was generated from the silviculture databases.
- Current NSR is defined as areas not planted by the end of the 1998 planting season
- Total backlog NSR = 5592 ha (2466.3+3125.6).
- Most 1997 blocks have been planted but not surveyed.
- NSR areas will be apportioned to all AUs based on existing managed stand distributions. Only NSR areas inside the timber harvesting land base will be available for future harvesting.
- Regeneration assumptions for backlog NSR will assume a 10-year Regen delay.

# 6. Current Forest Management Assumptions

- The area of NSR that will not be treated includes portions of managed backlog plantations that do not meet current stocking standards and are comprised of 1-5 ha sized pieces not considered plantable. The 2466 ha of backlog NSR is assumed to have an average stocking of 400 well spaced stems per hectare. There will be no further regeneration activities in those sites therefore a lower yield curve for those sites would apply.
- The 9534 ha of current NSR, is the silviculture obligation to restock harvesting openings that represent 2 years harvest (2 years current practice)
- The existing NSR is net of existing roads and landings.

## 6.4 Integrated resource management

### *6.4.1 Objectives which require forest cover requirements*

As noted in Section 4.1, the discussion on multiple objectives, forest cover requirements may be applied to a number of different types of areas including landscape units, wildlife habitat or visual quality areas. With the requirement to retain different forest characteristics across the landscape, it is important to identify how non-contributing forest (productive forest which does not contribute to the timber harvesting land base) may help to achieve forest cover requirements (i.e. maximum allowable disturbance or minimum area retention).

*Table 19. Forest cover requirements – base case*

| Zone or group | Maximum allowable disturbance (% area) | Green-up height (m) | Minimum retained area (%) | Minimum age or height for retention | Source of prescription and land to which contributes |
|---|---|---|---|---|---|
| Zone 'A', Morice LRUP | 1% | 3 | | | Timber harvesting land base Morice LRUP allows entry to address forest health issues |
| Visually Quality Class 1 (preservation) | 1% | 5 | | | Crown forested area for all recommended VQC' polygons |
| Visually Quality Class 2 (retention) | 5% | 5 | | | Crown forested area for all recommended VQC' polygons |
| Visually Quality Class 3 (partial retention) | 15% | 5 | | | Crown forested area for all recommended VQC' polygons |
| Visually Quality Class 4&5 (modification / max-modification) | 25% | 5 | | | Crown forested area for all recommended VQC' polygons |
| Telkwa Caribou Herd Recovery Program (key forested features) | 25% | 3 | 25%* of THLB in ESSF and SBS Telkwa Caribou Area | > 90 years | Timber harvesting land base |
| IRM area | 25% | 3 | | | Timber harvesting land base |

* District staff approximate that 50% of the area within the ESSF and SBS Telkwa caribou herd recovery area is high quality caribou habitat (key forested features), and thus the forest cover requirement of 50% > 90 years for high quality habitat has been modified to 25% of the THLB > 90 years.

Data Source and Comments:

District staff consider the above requirements to represent current practice

### 6.4.2 *Landscape level biodiversity*

Old seral forest cover requirements are specified by biogeoclimatic variant within each landscape unit. Landscape units have not yet been formally established. Draft landscape units will be used for this analysis to represent application and evaluation of biodiversity objectives. An average old seral requirement will be used assuming a distribution of high, medium, and low biodiversity emphasis options (BEO's) of 10:45:45 for each landscape unit. It is further assumed that the old seral requirement of a low BEO will be phased in over 140 years. Application of the full requirement after 140 years ensures that if the old-seral objective is not achieved at that time, forests can age sufficiently to achieve the full requirement by the end of three rotations (210 years) The old seral requirements by biogeoclimatic variant are listed in Table 20.

*Table 20. Old seral requirements by biogeoclimatic variant.*

| Biogeo-climatic unit | NDT type | Old seral requirement (%) starting in year 1 | 70 | 140 | Age (yrs) | Land base to which constraints apply |
|---|---|---|---|---|---|---|
| AT | 5 | N/A | N/A | N/A | N/A | na |
| CWHws2 | 2 | 6.7 | 8.1 | 9.4 | >250 | Crown Forested |
| ESSF mc | 2 | 6.7 | 8.1 | 9.4 | >250 | Crown Forested |
| ESSF mk | 2 | 6.7 | 8.1 | 9.4 | >250 | Crown Forested |
| ESSFmv3 | 2 | 6.7 | 8.1 | 9.4 | >250 | Crown Forested |
| MH mm2 | 1 | 14.2 | 17.1 | 19.9 | >250 | Crown Forested |
| SBS dk | 3 | 8.2 | 9.9 | 11.5 | >140 | Crown Forested |
| SBS mc2 | 3 | 8.2 | 9.9 | 11.5 | >140 | Crown Forested |
| SbS wk3 | 3 | 8.2 | 9.9 | 11.5 | >140 | Crown Forested |

Note: NDT 1 and 5 are not harvested

The percentages in Table 20 are calculated as follows:

Year 1: low % *0.333*0.45 + medium % * 0.45 + high % *0.10
Year 70: low % *0.667*0.45 + medium % * 0.45 + high % *0.10
Year 140: low % *0.45 + medium % * 0.45 + high % *0.10

where low %, medium % and high % are the old seral requirements for low, medium and high BEOs contained in the Forest Practices Code *Landscape Unit Planning Guide*.

Current policy is to only apply the mature plus old-seral requirement for natural disturbance type 3 in the base case. A sensitivity analysis will examine the impact on timber supply of applying mature plus old seral requirements to all natural disturbance types. An average mature+old seral requirement will be applied by biogeoclimatic variant within each landscape unit. This will be calculated in the same manner as the old seral requirement, except that the entire requirement will apply beginning immediately. The mature+old requirements are shown in Table 21.

*Table 21. Mature+old requirements seral requirements*

| Biogeoclimatic unit | NDT | Mature+old seral requirement (%) (starting in year 1) | Age (yrs) | Land base to which constraints apply |
|---|---|---|---|---|
| AT | 5 | N/A | N/A | na |
| CWH ws2 | 2 | 28.1 | > 80 | Crown forested |
| ESSF mc | 2 | 23.1 | > 120 | Crown forested |
| ESSF mk | 2 | 23.1 | > 120 | Crown forested |
| ESSFmv3 | 2 | 23.1 | > 120 | Crown forested |
| MH mm2 | 1 | 30.2 | > 120 | Crown forested |
| SBS dk | 3 | 18.7 | > 100 | Crown forested |
| SBS mc2 | 3 | 18.7 | > 100 | Crown forested |
| SbS wk3 | 3 | 18.7 | > 100 | Crown forested |

Note: Mature+old seral requirement only applied to NDT 3 in the base case.

For a second sensitivity analysis, the old and mature+old seral requirements recommended in the *Biodiversity Guidebook* for the draft BEOs outlined in Table 22 will be applied instead of an average BEO for each landscape unit.

*Table 22. Draft biodiversity emphasis options by draft landscape unit*

| Landscape unit | Biodiversity emphasis option |
|---|---|
| Buck | Low |
| Burnie | High |
| Fulton | Low |
| Gosnel | Intermediate |
| Granisle | Low |
| Houston - Tommy | High |
| Kidprice | Intermediate |
| Morice Lake | High |
| Morrison | Intermediate |
| Nadina | Intermediate |
| Nanika | High |
| North Babine | Low |

*continued*

*Table 22. Draft biodiversity emphasis options by draft landscape unit (concluded)*

| Landscape unit | Biodiversity emphasis option |
|---|---|
| Owen | Intermediate |
| Parrotts | Low |
| Sibola | High |
| Tahtsa | Low |
| Thautil | High |
| Tochcha/Natowite | Intermediate |
| Topley | Low |
| Troitsa | High |
| Valley | Intermediate |
| Whitesail | Intermediate |

### *6.4.3 Wildlife tree and wildlife tree patches*

The *Landscape Unit Planning Guide* describes two methods for maintaining stand structure over time; wildlife trees (WT's) and wildlife tree patches (WTP's). It is important to discuss the anticipated persistence of the particular method in different stand types. For example, in partial cutting systems, the trees that are retained may be planned for harvest at a later date.

In estimating the effects of WT's and WTP's, consideration should be given to whether the trees will ever be harvested and whether areas in riparian management zones or other forest zones outside the THLB are regularly being used to produce either WT's or WTP's. Recognizing the overlap will eliminate inappropriate reductions in volume or timber harvesting land base. Table 23 summarises how WTs and WTPs will be represented in the analysis.

*Table 23. Area reductions to reflect retention of wildlife tree patches in cutblocks*

| Management zone | Analysis unit | Persistence | Per cent (%) recommended in applicable guidebook | Residual area estimate on the timber harvesting land base (%) |
|---|---|---|---|---|
| IRM | All | Long term | 7.25 % | 3.6 % |

# 6. Current Forest Management Assumptions

Data Source and Comments:

This analysis revealed that based on the *Landscape Unit Planning (LUP) Guide* criteria (table A3.1 page 95), the district average WTP requirement (where draft landscape unit boundaries have been proposed) is 7.25%.

The major licensee's and the SBFEP are currently implementing WTP's at the cutting permit level. They are following WTP tables in the LUP guide, the DM's policy on stand level biodiversity, and a previous analysis completed in the Morice District in 1996. Currently, WTP's in the timber harvesting land base are considered deferred areas from harvest. Consistent with assumptions used in the 1996 FPC timber supply analysis, ½ of the area is assumed to come from the THLB. As a result, the area retained TSA wide for WTPs is 7.25 % of which 3.6 % will be assumed to come from the THLB.

The analysis will assume that WTP's are not large enough to contribute to old seral requirements and WTP's are not likely not to be harvested in the future due to succession, potential forest health losses and wind throw concerns over the next rotation. WTP reductions will be applied as a yield reduction of 3.6% in the timber supply analysis model.

# 7. Sensitivity Analyses

Sensitivity analysis can provide a measure of the timber supply impact of uncertainty in management assumptions and/or data. The magnitude of the increase or decrease in a particular variable should reflect the degree of uncertainty surrounding the assumption. By developing a number of sensitivity analyses, it is possible to determine which variables most affect results. The following tables outline sensitivity analysis unique to the Morice TSA (Table 24) and those normally carried out (Table 27) for AAC determinations.

*Table 24. Sensitivity issues specific to the Morice TSA*

| Issue to be Tested | Sensitivity Levels |
|---|---|
| Prioritize harvest based on existing forest development plans | ———— |
| Age when forest achieves "old" forest characteristics | +/- 20 years |
| Visually quality classes | Middle of the acceptable disturbance range |
| Inaccessible landscape units removed in the base case | re-introduce |
| Utilization of spruce and balsam. | Minimum 15cm DBH utilization |
| PAS | 50% official study areas of PAS removed from timber harvesting land base |
| Landscape level biodiversity | Apply landscape unit biodiversity requirements for mature plus old seral (45-45-10). |
| Landscape level biodiversity | Apply landscape unit biodiversity requirements for draft BEOs for old and mature plus old. |
| Wildlife tree patches | Remove all 7.25% from the yield curves |
| All stands – modify stocking | +/- 500 sph |
| Apply recreation B0, A1, B1 as reductions to timber harvesting land base | 100 % removal (only AO removed in the base case) |
| Genetic gain | 2.4% gain applied to regenerated spruce |
| Unsalvaged losses | +/- 25% existing and future |
| Bark beetle epidemic, harvest priorities for the next 10 years to reflect current bark beetle epidemic | Historic level of harvest directed at beetle epidemic (see Table 25) |
| Bark beetle epidemic, harvest priorities for the next 10 years to reflect increasing bark beetle epidemic | 50% increase in historic harvest level directed at beetle epidemic (See Table 26) |
| Minimum site index criteria | +/- 2 metres |

# 7. Sensitivity Analyses

*Table 25. Bark beetle sensitivity – volumes to be harvested by LU for first 10 years, current harvest*

| Landscape unit - current AAC to address existing infestations | Extreme hazard balsam** | High risk Spruce | High risk pine* | Total | 10% vol pine removed | 50% vol pine removed | 50% vol spruce removed | 100% Vol balsam removed |
|---|---|---|---|---|---|---|---|---|
| | Volume of stands at risk ($M^3$) by AU | | | | Volume at risk to be removed ($M^3$) by AU | | | |
| Buck | 3 587 | 846 953 | 1 218 910 | | 121 891 | | 423 476 | 3 587 |
| Burnie[6] | 1 535 510 | | 1 426 | | | | | |
| Fulton | 100 359 | 1 612 734 | 1 073 702 | | 107 370 | | 806 367 | 100 359 |
| Gosnel | 237 088 | 19 626 | 266 328 | | 26 633 | | 9 813 | 237 088 |
| Granisle | 116 106 | 399 992 | 44 591 | | 4 459 | | 199 996 | 116 106 |
| Houston - Tommy | 4 808 | 1 036 591 | 1 079 642 | | | 539 821 | 518 296 | 4 808 |
| Kidprice | 73 165 | 496 962 | 2 528 947 | | | 1 264 474 | 248 481 | 73 165 |
| Morice Lake[6] | 197 404 | 5 | 279 012 | | | 139 506 | | |
| Morrison | 346 326 | 3 844 318 | 19 911 403 | | 1 991 140 | | 1922 159 | 346 326 |
| Nadina | 29 472 | 1 084 241 | 1 740 219 | | | 870 109 | 542 120 | 29 472 |
| Nanika[6] | 354 427 | 436 333 | | | | | | |
| North Babine | 71 166 | 2 457 704 | 793 073 | | 79 307 | | 1 228 852 | 71 166 |
| Owen | 29 471 | 1 403 483 | 1 731 094 | | | 865 547 | 701 741 | 29 471 |
| Parrotts | 623 331 | 1 017 750 | 1 682 809 | | 168 281 | | 508 875 | 623 331 |
| Sibola[6] | 16 334 | | 93 660 | | | | | |
| Tahtsa | 89 050 | 161 172 | 421 722 | | | 210 861 | 80 586 | 89 050 |
| Thautil | 43 187 | 210 195 | 390 512 | | 39 051 | | 105 098 | 43 187 |
| Tochcha/Natowite | 267 298 | 3 947 994 | 932 488 | | | 466 244 | 1 973 997 | 267 298 |
| Topley | 191 488 | 228 513 | | | | | 114 256 | 191 488 |
| Topley | 191 488 | 228 513 | | | | | 114 256 | 191 488 |
| Valley | 602 | 379 794 | 82 912 | | 8 291 | | 189 897 | 602 |
| Whitesail | 86 192 | 48 602 | 2 305 567 | | | 1 152 784 | 24 301 | 86 192 |
| **Totals** | **4 416 371** | **19 632 962** | **36 770 891** | **60 820224** | **2 546 424** | **5 509 346** | **9 598 312** | **2 312 696** |
| existing AAC for 10 years | | | | **19 950 000** | | | | **19 950 000** |

[6] for this sensitivity, we are 16 7778 m3 above the 10 year AAC volume. * high + mod2 risk
** extreme hazard
^ in Troitsa B is in High = 851711 ha

# 7. Sensitivity Analyses

*Table 26. Bark beetle sensitivity – volumes to be harvested by LU for first 10 years, elevated harvest.*

| Landscape unit - 150% AAC to address high risk stands by LU | Extreme Hazard B** | High risk S | High risk P* | Total | 10% vol P removed | all P removed | 50% vol S removed | % Vol B removed |
|---|---|---|---|---|---|---|---|---|
| | Volume of stands at risk, ($M^3$) by AU | | | | Volume at risk to be removed, ($M^3$) by AU | | | |
| Buck | 3 587 | 846 953 | 1 218 910 | | | 1 218 910 | 423 476 | 3 587 |
| Burnie# | 1 535 510 | | 1 426 | | | | | |
| Fulton | 100 359 | 1 612 734 | 1 073 702 | | 107 370 | | 806 367 | 100 359 |
| Gosnel | 237 088 | 19 626 | 266 328 | | | 266 328 | 9 813 | 237 088 |
| Granisle | 116 106 | 399 992 | 44 591 | | 4 459 | | 199 996 | 116 106 |
| Houston - Tommy | 4 808 | 1 036 591 | 1 079 642 | | | 1 079 642 | 518 296 | 4 808 |
| Kidprice | 73 165 | 496 962 | 2 528 947 | | | 2 528 947 | 248 481 | 73 165 |
| Morice Lake# | 197 404 | 5 | 279 012 | | | 279 012 | | |
| Morrison | 346 326 | 3 844 318 | 19 911 403 | | 1 991 140 | | 1922 159 | 346 326 |
| Nadina | 29 472 | 1 084 241 | 1 740 219 | | | 1 740 219 | 542 121 | 29 472 |
| Nanika# | 354 427 | 436 333 | | | | | | |
| North Babine | 71 166 | 2 457 704 | 793 073 | | 79 307 | | 1 228 852 | 71 166 |
| Owen | 29 471 | 1 403 483 | 1 731 094 | | | 1 731 094 | 701 742 | 29 471 |
| Parrotts | 623 331 | 1 017 750 | 1 682 809 | | | 1 682 809 | 508 875 | 623 331 |
| Sibola# | 16 334 | | 93 660 | | | | | |
| Tr[illegible]sa | 89 050 | 161 172 | 421 722 | | | 421 722 | 80 586 | 89 050 |
| Thautil | 43 187 | 210 195 | 390 512 | | | 390 512 | 105 098 | 43 187 |
| Tochcha/Natowite | 267 298 | 3 947 994 | 932 488 | | | 932 488 | 1 973 997 | 267 298 |
| Topley | 191 488 | 228 513 | | | | | 114 257 | 191 488 |
| Troitsa# | | | 192 874 | | | | | |
| Valley | 602 | 379 794 | 82 912 | | | 82 912 | 189 897 | 602 |
| Whitesail | 86 192 | 48 602 | 2 305 567 | | | 2 305 567 | 24 301 | 86 192 |
| **Totals** | **4 416 371** | **19 632 962** | **36 770 891** | **60 820 224** | **2 182 276.9** | **14 660 162** | **9 598 312** | **2 312 696** |
| 150% AAC for 10 years | | | | **29 925 000** | | | | **29 925 000** |

# for this scenario the remaining 1.17 million will come from Balsam High Hazard types.

* high + mod2 risk
** extreme hazard
^ in Troitsa B is in High = 851711 ha

# 7. Sensitivity Analyses

*Table 27. Standard sensitivity analysis*

| Issue to be tested | Sensitivity levels |
|---|---|
| Existing stand yields | +/- 10% |
| Regenerated stand yields | +/- 10% |
| Minimum harvestable age | +/- 10 years |
| Old-growth site index adjustments | Use old-growth site index adjustments equations as per working paper 36 and 37 (balsam and spruce only, local pine adjustments in the base case). |
| Land base changes | +/- 10% |
| Visual quality classes | Bottom of range % disturbance |
| Harvest flow | Alternatives to the base case |
| Green-up periods | +/- 5 years |
| Integrated resource management zone | Change maximum area below green-up age to 20% |
| Caribou requirements | Change minimum retention by +/- 10% |